

APPLIED SCIENCE.

FRENCH METHOD IN ENGRAVING ON WOOD.—A French method in engraving on wood consists in first covering the block, with a layer of gelatin (0.39 grams to 31 grams of water) by means of a soft brush. When this coating is dry it is covered, in the dark, with a solution prepared of (1.) red prussiate of potash, 7.80 grams; water, 62.20 grams; (2.) ammonio-nitrate of iron, 9.10 grams in 62.20 grams water. These solutions are mixed and filtered, and the mixture is kept in the dark. After the layer is dry it is exposed under a negative from 10 to 12 minutes, and washed with a soft sponge, when a blue image appears. If thus prepared the coating does not shell off under the graver.

A VERY DELICATE BAROMETER.—An ingenious device has been constructed by Mendeleyef, which shows the slightest variations of pressure by means of a small U-shaped tube containing petroleum oil. One end of this tube is closed, and contains a certain volume of dry air maintained at a constant temperature, while the other end is open to the air. The instrument being accurately adjusted by means of a small plunger connected with the bottom of the U-shaped tube, so that the petroleum is exactly on a level in the two branches of the tube, it is found to be so extremely sensitive that the slightest variation of atmospheric pressure is shown by the alteration of the level, and the amount of this alteration can be measured with the greatest precision.

THE DEPOSITION OF FINE SEDIMENTS.—Dr. T. Sterry Hunt states, in reference to the question of the deposition of fine mud in the Mississippi, that the deposited matter requires from 10 to 14 days to subside; but that if sea-water or salt or sulphuric acid be added to the turbid water it becomes clear in from 12 to 18 hours. Thus is explained the rapid precipitation that occurs when the river water mixes with the salt waters of the Gulf of Mexico.

The cohesion of water diminishes in the brine, and was verified by Dr. Hunt. He found that the addition of 8 parts of chloride of calcium to 1,000 parts of water reduces the size of drops to one-ninth, and the precipitation of the mud is made very difficult.

It cost is much less than that of either of the other lights.

THE CONSTRUCTION OF WINDING STAIRCASES.—In Major Elliott's Report on European Lighthouses he notes that in several cases the stairs are circular, and apparently self-supporting, one end only being built into the wall, as in the Treasury at Washington. This method of stair-building is, he observes, universal in Europe, both in private and public buildings. The most recent lighthouse towers of the American system are constructed with conical interior walls and iron staircases winding around the interior of the cones. European towers are generally constructed with an exterior conical, and an interior cylindrical wall, leaving an unnecessarily large unused space between the two. The amount of masonry in the American system is the same as in the European, and is better calculated to resist the overturning effect of the severest gales.

STEAM FOG WHISTLES.—It has been found by Gen. Duane of the United States Engineers, in his experiments made to determine the best form of boilers for steam fog signals, that as the steam used is at a high pressure, and is drawn off at intervals, there is a constant tendency to foam and throw out water with the steam. To counteract this, a horizontal tubular boiler, like those used in locomotives, is recommended by him. The steam dome must be very large and surrounded by a steam pipe 12 inches in diameter. The water should be drawn off at least ten feet above the water level of the tank. The diameter of the boiler should be two-thirds of its length, and the vertical distance of its lower edge above the coping for a steam pressure of 50 pounds should be from one-third to one-fourth of the diameter.

AUTOMATIC REGISTRATION OF THE CHEMICAL ACTION OF LIGHT.—The measurement of the chemical intensity of the solar light has not yet become a subject of regular meteorological observation, because of the want of a proper instrument. This want is now partly supplied by a method proposed by Rescoe, who proposes to effect the measurement by the blackening of a paper saturated with chloride of silver, or rather by means of the time required in order that the exposure to the light may bring about the given intensity of shade. A uniformly prepared paper is placed in the apparatus during the previous night, and is by a mechanical arrangement exposed during the day to the light. The diameter of the paper should be drawn off at intervals, so that the normal, to know at once the number of moments of exposure corresponding to the strength of the light at that time. A series of observations made during the months of May, June, and July, have given very accurate results in the hands of Rescoe.

ADVANCES IN PHOTOGRAPHY.—In a review of recent discoveries in photography, Meldola states that since the year 1842, when Bequerel photographed the whole solar spectrum, and Dr. Draper the violet, blue, and ultra red, no successful attempt have been made to photograph the red end of the spectrum. Bequerel's result was obtained by a film of silver iodide first exposed to diffused light, and then to the action of the spectrum, by which process he was able to photograph the entire spectrum from the ultra violet to the ultra red. During the past year Dr. Vogel has demonstrated that, by varnishing the ordinary bromide of silver plates with a dye of coralline, we get the maximum of photographic action in the indigo and the yellow; and by using aniline green the maximum of activity in the indigo and red. Again, Bequerel has dissolved coraline in oil, and obtained the same and obtained similar results. The most remarkable action was observed in the case of chlorophyll, the use of which a spectrum image of great length was obtained from the ultra violet to the green, with a weaker impression from the green to the red. Continuing these observations in connection with what has more recently been published by Leopold, we find every reason to anticipate a new era in the history of the exact observation of the bands of any chemical compound. For example, we find that the spectrum of chlorophyll is composed of 120 bands, each of which is composed of 120 sub-bands, and therefore, by a proper selection of dyes, a sensitive plate may be prepared especially adapted to any or all operations on the spectrum.

NEW PHOTOMETERS.—Major Elliot reports that in his visit to the establishment of Morris, Chance at Birmingham the scientific director in charge, Dr. Hopkinson, presented him with a photometer of his own invention for the comparison of lights at a distance. It is very compact, and consists of two Nicol prisms which can be moved relatively to each other in azimuth. A little tube carries the analyzing prism, and a second tube contains the polarizing prism. The latter being turned until the observed light is just diminished to the point of invisibility, and another light being then observed in the same way, a comparison of the angles gives the relations of the powers of the lights. The French Lighthouse Commission employ a photometer different from Bunsen's as ordinarily used in America, in which, instead of keeping both the standard light and the one under test fixed in position, the former is moved until the beams from both pass up a slit or opening in the plane of the standard, and which, viewed on the reverse side, seems equally illuminated by the two lights. The distances from the photometer are then measured by a tape line, and reference to a calculating table shows at once the intensity of the light under test in terms of the standard. The unit of illumination in France is the candela, containing 40 grams of coal-oil. This French unit is estimated to be equal to between 9 $\frac{1}{2}$ and 11 $\frac{1}{2}$ of the English units or candles.

THE USE OF GAS FOR LIGHTHOUSES.—The great advantage of employing gas for lighthouse purposes is stated to consist in the fact that, by a very simple arrangement, the number of burners, and the brilliancy of the flame can be increased from time to time to an extraordinary brightness, such as to provide for its visibility in all kinds of thick weather, except, of course, that condition of fog which no light, not even the sunlight, can penetrate. In a fixed light apparatus, of any size, there is no occasion to alter the existing lenses if we wish to introduce the use of gas instead of oil; but in some lanterns it may be necessary to provide for additional lenses, and in others, the glass of the lantern may have to be replaced by glass of greater thickness, as the flame of gas is largely superior to that of any kind of oil. When the "power" of the gaslighter is turned on, the "cost per hour" is the greatest; but taking the average of a year's consumption, at several lighthouses, it appears that there is an actual saving of about \$300 per year by the use of gas. A very simple apparatus effects an automatic intermission in the light, which not only saves somewhat in

the consumption of gas, but acts as a means of distinguishing one lighthouse from another, precisely as is at present brought about by the introduction of the flashing system. A gaslight of the first order, employing Mr. Wigman's gas burners of 108 jets, would, if fixed, be equal to 70,000 standard candles; but, if revolving, be equal to 87,000 candles.

LAMP FOR BURNING NITRIC OXIDE GAS.—The brilliancy of the light produced by the combustion of nitric oxide gas, after mixture with a few drops of sulphide of carbon, has been known for some time, and its application to photographic purposes suggested; but it is not until recently that Messrs. Delachan and Mermet have constructed an apparatus by which it can be made practically available. They use a lamp made of a pint bottle, having two openings through the cork, and filled with fragments of some porous substance, as sponge, coke, or pumice, for the purpose of imbibing the sulphide of carbon. A tube, reaching within one-fourth of an inch of the bottom, passes through one opening in the cork, and a larger one through the other opening. This is about eight inches long, and may be of glass or metal, and is closely packed around with iron scale. The object, like that of the guaze in the safety lamp, is to prevent the return of the flame into the bottle, and its consequent explosion. The nitric oxide gas is passed into the bottle through the first-mentioned tube, and the gaseous mixture is conducted by a rubber tube to a kind of Bunsen burner, the air-holes of which are closed, and which is furnished with a small conical valve to regulate the flow of gas. This burner is also filled with iron scale. The object, like that of the guaze in the safety lamp, is to prevent the return of the flame into the bottle, and its consequent explosion. The nitric oxide gas is passed into the bottle through the first-mentioned tube, and the gaseous mixture is conducted by a rubber tube to a kind of Bunsen burner, the air-holes of which are closed, and which is furnished with a small conical valve to regulate the flow of gas. This burner is also filled with iron scale. The object, like that of the guaze in the safety lamp, is to prevent the return of the flame into the bottle, and its consequent explosion. 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